Advanced Distributed Learning Initiative

DOD Learning Repositories Use Cases

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DOD Repositories Working Group

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1. Scope

1.1 Concept. The purpose of this document is to describe use cases for Department of Defense (DOD) learning repositories and systems. The goal is understand how DOD learning repositories and systems are used so that a system that spans across the military services and other DOD organizations can be defined for managing, searching and finding learning resources and content.

1.1.1. *What is a use case?* A *use case* describes a specific scenario where someone or some system interacts with the target system. The purpose of a use case is to flesh out the functional requirements of the system. Table 1 describes the format used to document use cases. The use case would be documented by filling in the columns on the right as indicated with the information described by the headings on the left.

Use Case	
Identifier	Unique reference to the use case.
Name	Descriptive title.
Description	Summary of the scenario the use case describes. The scenario should highlight the need for a specific requirement or two in the target system.
Actors	People or systems that interact with the target system in this use case.
Pre-conditions	Expectations about the system before the use case begins.
Sequence of Events	Detailed step-by-step description of a scenario where the Actors interact with the system. A use case usually describes a scenario where everything goes as planned although alternative courses of action can also be described.
Post-conditions	Final state of the system upon completion of the use case. This entry can be left blank if the use case did not result in a change to the system.
Notes	Documentation of the requirements for which the use case illustrates a need and any issues that might prevent their unambiguous specification.

Table 1. Use Case Description Format

1.2 Document overview. This document contains two main parts: high-level DOD use cases and Service-specific use cases from the Army, Navy, Air Force, Marines, National Guard and other DOD entities such as the Joint Service and Defense Acquisition University (DAU). The high-level DOD use cases are documented according to the format defined in the previous section. The intent of this section is to capture general scenarios that can be applied across the Services to describe how learning repositories are used in the DOD. The Service-specific use cases are less formal descriptions of how specific Services and DOD organizations approach the learning repository issue. Where enough information was available, an attempt was made to identify common issues in the programs that address learning repositories. These issues include security, packaging and tagging, storing, searching and heterogeneous repository interoperability (interoperability with repositories other than learning repositories).

1.3 Background. This document is a product of the DOD Repositories Working Group (WG) being led by the Joint ADL Co-Lab in Orlando, FL. The purpose for the WG is to develop a

common DOD approach to interfacing and interoperating with learning repositories owned by the Services. The group consists of representatives from the Joint ADL, Academic ADL and ADL Co-Labs, and representatives from the Army, Navy, Air Force, Marines, National Guard and the Joint Service. The initial WG was designated by the Total Force Advanced Distributed Learning Action Team (TFADLAT) in September 2002. The WG was intentionally kept small to facilitate consensus. The large number of contributors reflects the dynamic membership in the group and the widening of scope to include the use cases of other DOD organizations.

The situation today is that each Service has some sort of learning repository capability. Until the creation of this WG, the Services' learning repository efforts were not coordinated. The Army has quite an extensive enterprise-level learning architecture with associated repositories while the Marine Corps has simply a file system. The other Services fall somewhere in between these extremes. Each Service also has related repository efforts for such data as knowledge capital (knowledge management), technical data and lessons learned for which it may be desirable to also provide interoperability.

Through the Repositories WG meetings held thus far, the Services agree that creating one big DOD repository system is not the right approach. They also agree that the group should not be attempting to standardize on a single repository product. This leaves a heterogeneous system of systems that are bound together through a common set of protocols and interfaces. The desirable approach is to identify an industry specification(s) or standard(s) that can satisfy the system requirements. This document is the first step towards completing that task.

2. References

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Statement of Work for V-22 Advanced Distributed Learning (ADL), Naval Air Systems Command (NAVAIRSYSCOM), 3 April 2002.

Toward the Development of a Defense Information System for Sharable Content Objects, Version 1.0, Advanced Distributed Learning (ADL), 3 February 2003.

Watson, Paul, Product Manager for Digitized Training, Program Executive Office for Simulation, Training & Instrumentation (PEO STRI); Private meeting with Steve Slosser, Joint ADL Co-Lab, 7 April 2003.

3. Definitions

- **Asset** – Learning content in its most basic form composed of electronic representations of media, text, images, sound, web pages, assessment objects or other pieces of data that can be delivered to a Web client. (From **The Sharable Content Object Reference Model (SCORM) Version 1.2, The SCORM Content Aggregation Model**, 1 October 2001, www.ADLnet.org)

- **Authentication –** The process of identifying an individual usually based on a username and password. In security systems, authentication is distinct from *authorization*, which is the process of giving individuals access to system objects based on their identity. Authentication merely ensures that the individual is who he or she claims to be, but says nothing about the access rights of the individual. (From Webopedia, 24 September 2002, www.Webopedia.com)

- **Authorization –** The process of granting or denying access to a network resource. Most computer security systems are based on a two-step process. The first stage is *authentication*, which ensures that a user is who he or she claims to be. The second stage is authorization, which allows the user access to various resources based on the user's identity. (From Webopedia, 24 September 2002, www.Webopedia.com)

- **Communities of Practice (CoP) –** Communities of practice are groups of people who come together to share and to learn from one another face-to-face and virtually. They are held together by a common interest in a body of knowledge and are driven by a desire and need to share problems, experiences, insights, templates, tools, and best practices. (From Defense Acquisition University (DAU), http://deskbook.dau.mil/jsp/cop.jsp)

- **Learning Content Management System (LCMS)** – A multi-developer environment that allows one to create, store, reuse, manage and deliver learning content from a central object repository. Most LCMS systems also have built-in LMS functionality. (From *Learning Management Systems and Learning Content Management Systems Demystified*, Brandon-Hall.com, www.brandonhall.com/public/resources/lms_lcms/)

- **Learning Management System (LMS)** – A class of products with functionalities designed to deliver, track, report on and manage learning content, student progress and student interactions. The term LMS can apply to very simple course management systems, or highly complex enterprise-wide distributed environments. (From **The Sharable Content Object Reference Model (SCORM) Version 1.2, The SCORM Overview**, 1 October 2001, www.ADLnet.org)

- **Learning Repository** – A repository containing resources used for learning, training and education. For purposes of this document, it is assumed that the resources are in digital form.

- **Repository** – A central place where data is stored and maintained. A place where multiple databases or files are located for distribution over a network. (From Webopedia, 9 April 2003, www.Webopedia.com) For purposes of this document, it is assumed that the repository is realized as network-capable computer system.

- **Sharable Content Object (SCO) –** A collection of one or more assets that include a specific launchable asset that utilizes the SCORM Run-Time Environment to communicate with Learning Management Systems (LMSs). A SCO represents the lowest level of granularity of learning resources that can be tracked by an LMS using the SCORM Run-Time Environment. SCOs are intended to be subjectively small units, such that potential reuse across multiple learning objectives is feasible. (From **The Sharable Content Object Reference Model (SCORM) Version 1.2, The SCORM Content Aggregation Model**, 1 October 2001, www.ADLnet.org)

- **Sharable Content Object Reference Model (SCORM)** – A set of interrelated technical specifications and guidelines designed to meet the Department of Defenses high-level requirements for Web-based learning content. (From **The Sharable Content Object Reference Model (SCORM) Version 1.2, The SCORM Overview**, 1 October 2001, www.ADLnet.org)

4. Use Cases

These high-level Department of Defense (DOD) use cases are designed to articulate repository system functionality in the context of broad classes of actors. Actors are people or systems that participate in the process of performing a use case. For purposes of these use cases, the broad classes of actors are Producer, Performer, Learner and Coordinator, which are defined as follows:

Producer – An actor that participates in the process of developing resources for or modifying resources in the repository system. An example of this type of actor is a software developer or an instructional system designer responsible for developing learning content.

Performer – An actor that needs to fulfill a job requirement by the informal act of acquiring knowledge through refresher training or accessing the latest information in their community of practice. An example of this type of actor is a DOD employee or Warfighter seeking information needed to fulfill an immediate performance need through focused training.

Learner – An actor that needs to fulfill an individual development requirement by the formal act of acquiring knowledge through education or training. An example of this type of actor is a DOD employee or Warfighter following an individual development plan to acquire the skills necessary to achieve a level of competence for a job.

Coordinator – An actor that accesses and aggregates resources from the repository system for use by another actor. An example of this type of actor is a training coordinator or instructional designer assembling content necessary satisfy the objectives of an individual development plan.

For purposes of this document, the actors are referred to by their generic names although in practice they will have analogous human roles. The Coordinator could however be a software system designed to organize a curriculum from repository resources for a Learner to use.

Figure 1 depicts a consolidate picture of the use cases that follow. Most DOD organizations guide the Learner through some sort of structured learning environment where they most likely access the training via an LMS. After all, a Learner can not be expected to know that which they don't know. Consequently, they are not in a good position to judge the quality and authoritativeness of learning content. A Learner may be someone in a program of study or performing continuous learning. In both cases, assessment of learning objectives is done.

In contrast, the Performer already has some mastery of the learning material and has some idea what they are seeking. They may look to other sources to acquire this knowledge besides learning repositories including but not limited to tech data repositories or knowledge management systems. This learning may also include some sort of assessment. The time spent learning is typically shorter. The goal is to acquire the knowledge quickly and get back to the job.

The Coordinator is responsible for assembling and storing in the LMS the content that the Learner accesses. This individual is most likely searching for content at the SCO or course level.

The Producer, however, has a need to seek courses, learning objects and assets as well as technical data. They may work closely with an Instructional Designer or someone that has those skills to realize the software products that become the learning content. The Producer makes use of development tools to create the end product.

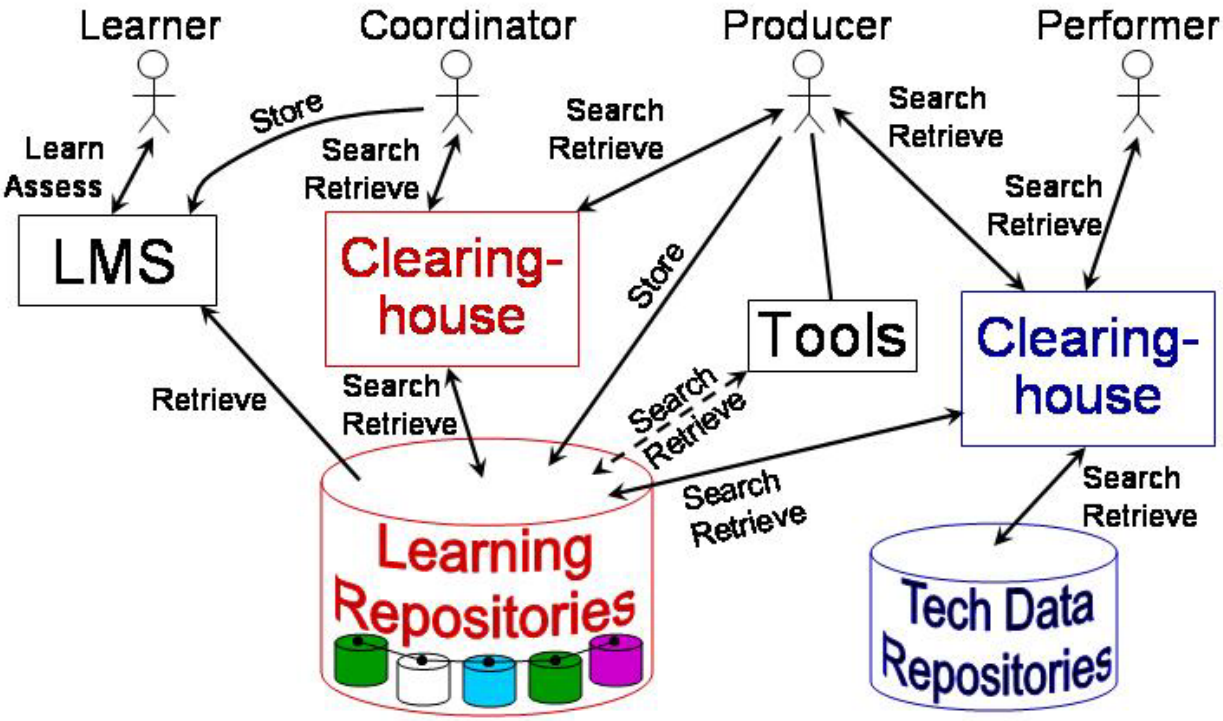

Figure 1. DOD Repositories Use Cases

4.1 UC-DOD-1

Use Case	
Identifier	UC-DOD-1
Name	Heterogeneous Resource Search and Retrieval
Description	The Actor is looking for and subsequently retrieving resources on a certain topic or subject domain. The Actor does not care about the type or level of resource aggregation returned from the search. This search and retrieval scenario is similar to a typical user's Web search.
Actors	Producer, Performer, Coordinator (Learner)
Pre-conditions	Actor has access to a repository system search client.
Sequence of Events	1) The Actor enters key words and other search parameters, and requests a query of the system using a search application. 2) The system returns a list of resources that satisfy the search criteria. The Actor has the option of tailoring the specified parameters to narrow or broaden the search as desired. 3) The Actor sees a prospective resource in the list returned from the repository system and selects the resource to display more information and the option to retrieve it. The Actor can return to step 2 if the resource is determined to be inadequate at this step. 4) The Actor downloads the resource to their local system for use, or simply references the location in the repository as appropriate.
Post-conditions	
Notes	• This use case requires that the vocabulary, policy and procedures be in place that allow for metadata resource elements to be consistently specified and available for use in searches. Standard approaches to assigning keywords and employing taxonomies would facilitate searching. • The Learner is placed in parentheses in the actor list. The question is this: Should the repository system be designed for direct access by a Learner, or is it expected that the Learner will access learning resources through an intermediary like a Learning Management System (LMS)? • The nature of the search application is also of interest. A search query could be directed to the repository system itself, or to a clearinghouse device that maintains only the metadata. The former requires protocols for requesting search services upon specific repositories in a system. This would not be necessary for the latter, but protocols for gathering and updating metadata in the clearinghouse system would be required. Both would require protocols for accessing the content in the repositories where it is stored.

4.2 UC-DOD-2

Use Case	
Identifier	UC-DOD-2
Name	Homogeneous Resource Search and Retrieval
Description	The Actor knows that their need is for a certain type of resource and wishes to restrict the repository system search to just that class of resources. In the learning domain, those resources would be assets, SCOs, courses or aggregations.
Actors	Producer, Performer, Coordinator (Learner[1])
Pre-conditions	Actor has access to a repository system search client that allows for the selection of parameters including the resource type and key words at a minimum.
Sequence of Events	1) The Actor selects the resource type for which they are looking from a pull-down menu on the search screen. 2) The Actor enters key words and other search parameters, and requests a search of the metadata in the system. 3) The system returns a list of resources that satisfy the search criteria. The Actor has the option of tailoring the specified parameters to narrow or broaden the search as desired. 4) The Actor sees a prospective resource in the list returned from the repository system and selects the resource to display more information and the option to retrieve it. The Actor can return to step 3 if the resource is determined to be inadequate at this step. 5) The Actor downloads the resource to their local system for use, or simply references the location in the repository as appropriate.
Post-conditions	
Notes	• This use case requires that the vocabulary, policy and procedures be in place that allow for the various resource types to be specified in the metadata. • This use case could also apply to a search where an actor wishes to restrict the search according to other parameters, such as file format, browser model, interactivity level or copyrights. • The same issues raised in UC-DOD-1 would also apply here.

[1] See comment about Learner in *Notes* section of UC-DOD-1.

4.3 UC-DOD-3

Use Case	
Identifier	UC-DOD-3
Name	Multi-permission Resource Search and Retrieval
Description	The Actor needs to find resources for which they have access to in a multi-permissions repository system.
Actors	Producer, Performer, Coordinator (Learner[2])
Pre-conditions	Actor has access to a repository system capable of managing users and content according to defined permission levels.
Sequence of Events	1) The Actor logs into the repository system using the appropriate security mechanisms (username, password, biometrics). The system authenticates the user and determines their permission levels. 2) The Actor initiates a search session as described in UC-DOD-1. 3) The system returns a list of resources that match the Actor's search criteria. The Actor is able to access some of the resources because they have permission to do so. The Actor can view restricted information about some of the resources, but cannot access them because they don't have the proper permissions. Still, other resources that might otherwise have matched the Actor's search criteria have been filtered out of the "hit" list because the user doesn't even have the permission to know that they exist. 4) The Actor downloads the resource to their local system for use, or simply references the location in the repository as appropriate. Both actions are logged in the system appropriately.
Post-conditions	The repository system generates the appropriate accounting logs for any resources the Actor accesses or references.
Notes	• This use case requires an appropriate vocabulary, policy and procedures be in place to allow for resource permission levels to be appropriately indicated in the metadata. • This use case also requires that the repository system is able to authenticate users and determine their permission levels for like tagged resources. • This use case requires that the repository system is able to at a minimum log access to resources and implements other security mechanisms as appropriate to the security model implemented. • The generic word "permission" was used to indicate a given computer security model. The DOD employs several models to protect data. Information classification, procurement sensitivity and personnel actions are three that come immediately to mind; however, the procedures and degree to which these data classes are protected is very different. The requirements for specific data protection models will have a major impact on how this use case is met.

[2] See comment about Learner in *Notes* section of UC-DOD-1.

4.4 UC-DOD-4

Use Case	
Identifier	UC-DOD-4
Name	New Resource Storage
Description	A Producer needs to store newly developed resources in a repository that is part of a system of repositories.
Actors	Producer
Pre-conditions	Actor has access to a repository system that collaborates with a distributed system of repositories.
Sequence of Events	1) The Actor initiates a request to store a new resource or resources that will be registered on the repository system. 2) The system registration authority returns with a metadata form required to perform the resource registration process. Some of the fields have pull-down menus with which to choose from tightly-defined vocabulary entries. Alternatively, the Actor may specify the location of a metadata file that they created beforehand with a metadata generator tool. Once this action is completed, the metadata definition is submitted to the registration authority. The identifier element is not specified at this step. 3) The registration authority verifies the metadata description and prompts the Actor for the location of the resource(s) to be uploaded. If there were errors in the metadata definition, then the registration authority would flag the incorrect fields and prompt the Actor for the proper information. The Actor submits the resource location to the registration authority. 4) The registration authority verifies the resource(s) location and contents against the submitted metadata. If the two are incompatible in some way, then the errors are indicated and the Actor is prompted either to correct the metadata, specify a different resource location, or to abort the process. 5) The registration authority assigns and returns a unique identifier upon successful submission of the resource(s). The unique identifier completes the metadata description.
Post-conditions	The new resource and its metadata is stored in a repository, and made accessible to the repository system through search and retrieve mechanisms.
Notes	• This use case requires that a process and system be in place to assign and manage unique identifiers. • Issue to be resolved: Should there be a DOD-wide registration system or should this be handled by the Services? Is it really necessary to assign unique identifiers to repository content? If not, how much will this hinder content discovery by creating confusion between like or similar resources.

4.5 UC-DOD-5

Use Case	
Identifier	UC-DOD-5
Name	Coordinated Resource Gather
Description	A Coordinator needs to find and retrieve verified, validated and accredited (VV&A) resources to meet a specific need for a user. Examples of this type of need would be creating an individual training development plan, an educational curriculum or a maintenance procedure.
Actors	Coordinator
Pre-conditions	• Actor has access to a repository system that can indicate the relevance of resources within a community of practice or subject matter domain. • The Actor is able to determine from the data given in the metadata and the relevance indicators a recommended course of action for a user.
Sequence of Events	1) The Actor is given a request by a user to assemble VV&A'ed resources to meet the need indicated. 2) The Actor performs multiple instances of use case UC-DOD-2 to collect the resources required using a search application. Each search is evaluated for relevance to the indicated need. 3) The Actor presents the list of resources to the user.
Post-conditions	
Notes	• This use case requires that the vocabulary, policy and procedures be in place that allow for the various resources to be ranked according to relevance in a community of practice or subject matter domain. • This use case requires that there be a VV&A process in place to ensure the integrity of the content and assign the relevance rating indicated above. • This use case Actor (Coordinator) would most likely be a human in the near-term, but the optimal situation would be to have these kinds of tasks performed by machine. This is possible only if the previous bullet is satisfied. • The same issues raised in UC-DOD-1 and UC-DOD-2 would also apply here.

4.6 UC-DOD-6

Use Case	
Identifier	UC-DOD-6
Name	Multi-heterogeneous Repository Resource Search
Description	The Actor needs to find and retrieve different types of resources stored in different types of repositories across the repository system. For purposes of this use case, it is assumed that the metadata describing the resources in the different repositories is different, or the same type of metadata applied in different ways.
Actors	Performer, Coordinator
Pre-conditions	Actor has access to a repository system search client. This domain-specific client (training, for instance) may be attached to a system that is capable of translating search parameters to that of the repositories to be searched, or it may be a general clearinghouse search application.
Sequence of Events	1) The Actor enters key words and other search parameters, and requests a query of the system using a search application. 2) The system performs the necessary translations of the search parameters to ones that are compatible with repositories to be searched, and returns a list of resources that satisfy the search criteria. The Actor has the option of tailoring the specified parameters to narrow or broaden the search as desired. 3) The Actor sees a prospective resource in the list returned from the repository system and selects the resource to display more information and the option to retrieve it. The Actor can return to step 2 if the resource is determined to be inadequate at this step. 4) The Actor downloads the resource to their local system for use, or simply references the location in the repository as appropriate.
Post-conditions	
Notes	• This use case assumes the existence of some mechanism for search interoperability among different repositories in the system. The generally agreed upon approach for doing this in the digital library community is with a *crosswalk*, an expressed mapping relationship between the elements of different metadata specifications. A transformation between different XML metadata specifications has been demonstrated through an XML Transformation (XSLT). • The same issues raised in UC-DOD-1 and UC-DOD-2 would also apply here.

5. Service Systems and Requirements

The following sections describe learning repository system efforts and requirements within the Services and other DOD organizations. The purpose is to present an analysis of these systems that shows the use cases in the previous section accurately reflect the needs of DOD. The reader is encouraged to obtain the references for a comprehensive description of these systems. All of the use cases in the previous section generally apply to the Service systems and initiatives. Where a use case or requirement has particular implications to one of the use cases in the previous section, the use case number is listed in parentheses for emphasis.

5.1 Army Use Cases and Requirements. The Army created the Army Training Information Architecture (ATIA) for information exchange among heterogeneous Army training systems. The Army found that over time courses and lessons developed with a variety of authoring tools were not compatible with each other in terms of reuse or use with a variety of learning management systems. The ATIA is intended to facilitate the exchange and reuse of information through a common set of interchange standards, data object taxonomies, and software functional development guidelines.

The ATIA is composed of three views:

- *Operational Architecture (ATIA-OA)* describes Army training organizations, activities and requirements.
- *Systems Architecture (ATIA-SA)* describes the current Army training system components.
- *Technical Architecture (ATIA-TA)* describes the technical standards that must be complied with in IT development efforts.

The ATIA-SA is divided into component building blocks called Automated Information Systems (AIS). The physical instantiation of ATIA is called the ATIA-Migrated (ATIA-M).

The ATIA-M Enterprise Database (EDB) is the repository of training and reference materials for all of Army training. It is designed to capture data to support courseware development, task development, unit training, individual training, and numerous other functional areas of Army Training. The ATIA-M also includes the Digital Library/Data Repository (DLDR) AIS which is the collection of functionality that provides access to finished products maintained in the Reimer Digital Library (RDL) and to courseware component parts ("bench stock"), media objects, and other data maintained in the ATIA-M Data Repository (DR). Its use is mandated for ATIA compliance in order to maintain the integrity of the ATIA EDB and the contributing federation of proponent databases. Initial Operational Capability version 3 (IOC3) calls for the integration of a Commercial Off-The-Shelf (COTS) content delivery system into the ATIA-M environment. This configuration will allow for more efficient content distribution and routing to user locations.

The following Army use cases and requirements have an impact on the identification and definition of a DOD learning repositories specification:

5.1.1 ***Security - ATIA.*** The Common Core Services (CCS) AIS is the controlling mechanism and the entry point for users of the ATIA-M. The CCS provides much of the

infrastructure services, such as login, security, and user interaction. One of the design principles of ATIA was to provide a single portal for users of all the various functionality of Army training. The CCS AIS provides a common entry aperture and common software services and utilities required by all of the ATIA-M configurations.

ATIA-M uses Army Knowledge Online (AKO) (Army knowledge management system) as a source to authenticate users. A strategy known as *lazy authentication* will be employed; that is, ATIA-M will defer authentication of users until the user's identity must be known. For example, users browsing public documents will not be required to authenticate until they attempt to access a portion of the system that is protected by the security realm. At this point, ATIA-M will follow the convention of the AKO login process by prompting the user for a user ID and password with a web browser supplied dialog window. Other authentication techniques may be used in the future such as digital certificates, smart cards and biometrics. ATIA-M will use a Lightweight Directory Access Protocol (LDAP) server to cache AKO user information. This process allows ATIA-M to augment data about the user with ATIA-M specific information.

ATIA-M attempts to use as much as possible the role-based declarative security model found in the Java 2 Enterprise Edition (J2EE) platform which provides the system's software architecture. Security is implemented with a combination of *course-grained* and *fine-grained* authorization checks. J2EE provides course-grained security which can be used to control user access to portions of the site. Custom logic must be written to provide for fine-grained security which is used to control the activities of a user on specific data according to access rights associated with that data. ATIA-M designates the following activities as secure: Administer, Read, Create, Copy/Derive, Update, Delete, and Change Status. Ultimately, to edit data in the system a user will have gone through an authentication check, a course-grained authorization check, and finally a fine-grained data specific authorization check in that order. If any check in the authentication/authorization chain fails, then the user will not be permitted to accomplish the operation.

ATIA-M IOC3 will have a web-based client for access which must be protected by the security system, and may also have desktop clients that might communicate with the server-side infrastructure via a web-services mechanism. ATIA-M will use Secure Sockets Layer (SSL) encryption to communicate with both AKO and with the client browser. Finally, the security management scheme will allow delegation of administrative rights to reflect the fact that the best people to manage security of data in a user community reside in that community. (UC-DOD-3)

5.1.2 ***Packaging and Tagging - ATIA.*** With respect to metadata tagging, ATIA only addresses resources at the asset level. An Army SCORM conformant asset is a uniquely identifiable electronic representation of data that is required for playability of Interactive Multimedia Instruction (IMI) courseware or is required for delivery of training/doctrine content. All file elements, as defined in the SCORM v1.2 Content Packaging Specification, are assets. A SCORM asset may also be composed of multiple assets. When an asset is composed of multiple assets, each asset must have metadata. Each asset

must have SCORM asset metadata, including as a minimum: general/title and description; lifecycle/contribute/role, centity, and date; metametadata/metadatascheme; technical/format, size, and location; and rights/cost and copyright and other restrictions. Note that this list goes beyond the SCORM mandatory elements to include some that are optional. Even though metadata tagging is only specified at the asset level, it is interesting to note that the ATIA is required to support a search capability at all levels of the Army Learning Object Model which includes courses, modules, lessons, learning objectives and steps/activities. (UC-DOD-1)

5.1.3 ***Storing – ATIA.*** ATIA-M defines processes to allow approved, validated training products to be published to the DL and made available to end users through the content delivery system. The approved content will be considered static in the sense that it resides in a standard format (HTML, PDF, Word document, etc.) and is not regenerated dynamically from the ATIA-M database. The process proceeds as follows:

- Call publishing component that will generate product in specified format and deliver product to DL directory structure used for publication and content delivery scheme.
- Initiate call to update DL product metadata.
- Initiate call to update DL card catalog.
- Ensure synchronization event for DR is initiated.

A user will need Document Administrator access in order to add/update/delete document information in the DL catalog using a Document Management tool. ATIA-M must perform authentication and authorization to determine this. DL catalog data includes the following:

- Title
- Unique number
- Type
- Version
- School
- Organization
- Approved release date
- Distribution
- Author information
- Product location (hostname, IP address, port number, file location, file name)
- Product Time-To-Live (TTL) for older versions

DL content will be provided linked metadata in the DR for DL users to view all associated DR components for a given DL product in the catalog. (UC-DOD-4)

5.1.4 ***Searching – ATIA.*** The finding (discovery) of finished end products in DL will consist of searches that can be filtered from information contained in the DL catalog. Authorizations for access to DL items will be controlled by security mechanisms. Some of the filtered fields include the following:

- Product identifier

- Document Number
- Title
- Product type
- Author
- School
- Proponent
- Organization
- Government Agency
- Approval date
- All approved versions
- Site location

Each DL item (group of HTML, Word or PDF documents, etc.) will have the following information in the catalog:

- Is the DL item open to the public or restricted to specific users and/or groups (i.e. DOD components, U.S. Government Agencies, U.S. Government Contractors, Foreign Nationals).
- Can the DL item be sent in the clear or does it have to be encrypted using Secure Socket Layer (SSL).
- There can be two primary sources of the DL item, local file server, or another web server. If the source is another server, the system can either act as a proxy server, or redirect the user to the other web server. If the ATIA-M system is the proxy server the DL items will pass through the ATIA web server allowing it to process the HTML for things such as (server side document tags).

If a DL item is restricted, then the user's authorization level will be validated against the DL item's distribution restrictions. If the user does not have the proper authorization level, the DL item will not be displayed and an error page will be displayed. Items requiring encryption will be sent using SSL. DL items can reside on local file servers, or on Web servers located at another location such as a proponent school. An integrated file service approach will allow users to access DL items regardless of their location. The user will also be able to find a list of managed DR components that are associated with approved end products published in the DL. (UC-DOD-1, UC-DOD-2, UC-DOD-3)

5.1.5 ***Heterogeneous Repository Interoperability - Army.*** ATIA-M external system interfaces are conducted through a common portal to the DLDR. ATIA-M data objects import/export functionality allows valid users to select and request to import or export ATIA-M specific datasets to or from external DR processes in a XML-based format. The current ATIA-M documentation identifies two systems from which it will allow user to obtain data: the Training and Doctrine Command (TRADOC) Education Data System-Redesign (TREDS-R), and the Standard Army Training System (SATS). The TREDS-R interface will allow users to access test associated with an Army Correspondence Course Program (ACCP). The SATS interface will allow users to download training products as a Sybase database. The documentation indicates that other interfaces may be identified at a later date. (UC-DOD-6)

The Army Warrior Knowledge Network (WKN) program is a knowledge system for creating knowledge, growing leaders and providing decision support to training exercises and military operations. WKN is separate but complimentary to ATIA. While neither program seems to explicitly state interfacing with the other as a requirement, WKN's Dr. Rick Morris, CIO/G-6, believes that interoperability among the systems is necessary to establishing a web-based knowledge system and learning community. Mr. Jim Ritter with the Center for Army Lessons Learned (CALL) has demonstrated the use of Extensible Style Sheet Transformations (XSLT) as a way to map between knowledge management and SCORM metadata specifications – a necessary function for interoperability between disparate repository systems. (UC-DOD-6)

The Common Training Instrumentation Architecture (CTIA) is the Army's simulation training architecture. While there is currently no functionality defined between CTIA and ATIA, Mr. Paul Watson, Product Manager for Digitized Training, PEO STRI, sees the need to access Unit Training Management Configuration (UTMC) data stored in the ATIA DLDR simulation exercises, and then update the data back in ATIA from CTIA following a simulation exercise. (UC-DOD-4, UC-DOD-5, UC-DOD-6)

5.2 **Navy Use Cases and Requirements**. The Navy's learning repository efforts are defined through the Integrated Learning Environment (ILE). The Navy ILE currently in the early stages of architectural development; therefore, is highly subject to change. Nevertheless, a number of important repository use cases and requirements have been identified with implications to a DOD repositories specification through draft technical documents. These documents identify requirements that map to the general DOD use cases. The following Navy use cases and requirements have an impact on the identification and definition of a DOD learning repositories specification:

5.2.1 ***Security - ILE.*** The Navy LMS is required to authenticate to the Defense Eligibility Enrollment Reporting System (DEERS). Although this is not mentioned as a requirement for a repository system or LCMS, this may also be a requirement for access to learning resources through these systems. ILE generally regards the LCMS as the repository system. ILE also plans to implement Single Sign On (SSO) integration whereby a user's authentication is passed on to all devices in the system (LMS, LCMS)

after they log into the portal. That portal has been identified as Navy Knowledge Online (NKO). (UC-DOD-3)

5.2.2 ***Packaging and Tagging - ILE.*** Content ingested into the ILE will need to be contained within a valid IMS or SCORM package. The ILE requires that content be tagged with IEEE LOM standard metadata (due to also be specified in SCORM Version 1.3). All resources contained in IMS packaging must be metatagged. Content contained in SCORM packaging will only be identified down to the SCO level; however, no guidance is given concerning metatagging SCORM content below the SCO level. The ILE technical document provides requirements for filling mandatory and optional metadata elements from the course down to the asset level. (UC-DOD-4)

5.2.3 ***Heterogeneous Repository Interoperability - Navy.*** Navy has identified parallel efforts to store content in digital repositories in both the training and the tech data communities, and has deemed it advantageous to share this information through the common architecture of ILE. Rather than produce and deliver technical manuals on hard media (like CDs), the Navy is prototyping the Tech Data Knowledge Management (TDKM) project which is centered on electronic delivery of technical data from an authoritative source (repository) to a surface ship, submarine or shore-based facility. The Navy ILE is a similar system for learning resources. While both communities would retain and maintain their own repositories, ILE would allow them to be integrated and searched through a common portal. At a November 2002 working group meeting, both communities recognized that the type of data described is different enough to justify the use of different metadata specifications; however, the SCORM and the tech data specifications were similar enough to identify a mapping between the two (known as a *crosswalk* in the digital library community). At the meeting, Mr. Glenn Handrahan, SAIC, related how he had prototyped an XSLT transform between TDKM and SCORM metadata. (UC-DOD-6)

5.3 <u>Air Force Use Cases and Requirements</u>. The Air Force has a growing need for a learning repository capability to house content at its schoolhouses and commands. The Air Force Institute for ADL (AFIADL) recognizes this need and has taken on the task of addressing this requirement from an enterprise perspective. The main thrust of this effort is being worked through a Joint ADL Co-Lab funded prototype project to explore and provide solutions to the problems of learning object discovery, interoperability, and reuse in a large-scale digital environment. AFIADL considers this project to be a prerequisite to the development of a metadata and content repository system for the Air Force. The objectives of the project are as follows:

1. Develop standardized domain-specific taxonomies for AF career fields (functional areas).
2. Develop documents that delineate business rules, processes, guidelines, and workflows for tagging, storing, and retrieving content.
3. Develop prototype software to accomplish the above activities within an ADL/SCORM environment.

Taxonomies are considered useful for classification of content within a specific domain, and ensure reusability and consistency in describing and storing. AFIADL will develop taxonomies

for a few career fields using a field ethnography approach, and document the process by which others can be created.

AFIADL has also inherited the Joint Multidimensional Education Analysis Systems (JMEANS) data repository system that was initially conceived by Air University to house their classroom training materials. Although JMEANS is not suitable for use as a learning object repository as originally built, AFIADL has taken on the task of modifying that product for such use.

The following is a general use case for an Air Force repository system identified by AFIADL:

Use Case	
Identifier	UC-USAF-1
Name	Air Force Advanced Distributed Learning Repository
Description	The Actor can store newly developed resources in a repository that is part of a system of repositories.
Actors	Producer, Performer, Coordinator (Learner)
Pre-conditions	Actor has access to a repository system capable of managing users and content according to defined permission levels. Actor has access to a repository system search client. Actor has access to a repository system that collaborates with a distributed system of repositories, and sufficient privileges to perform authorized actions.
Sequence of Events	1. The Actor logs into the repository system using the appropriate security mechanisms (username, password, biometrics). The system authenticates the user and determines their permission levels. 2. The Actor initiates a search session that proceeds much like that of UC-DOD-1. 3. The system returns a list of resources that match the Actor's search criteria. The Actor is able to access some of the resources because they have permission to do so. The Actor can view restricted information about some of the resources, but cannot access them because they don't have the proper permissions. Still, other resources that might otherwise have matched the Actor's search criteria have been filtered out of the "hit" list because the user doesn't even have the permission to know that they exist. 4. The Actor enters key words and other search parameters, and requests a search of the system. 5. The system returns a list of resources that satisfy the search criteria. The Actor has the option of tailoring the specified parameters to narrow or broaden the search as desired. 6. The Actor sees a prospective resource in the list returned from the repository system and selects the resource to display more information and the option to retrieve it. The Actor can return to step 2 if the resource is determined to be inadequate at this step. 7. The Actor downloads the resource to their local system for use, or adds it to a package of other resources in the repository as appropriate. Both

	actions are logged in the system appropriately. 8. The Actor initiates storage with a metadata form required to perform the resource submission process. Some of the fields have pull-down menus with which to choose from. The Actor can add to an overall existing vocabulary that can then be selected via dropdown at the metadata screen. 9. The repository system verifies the metadata description and allows the Actor to browse a resource(s) to be uploaded. If there were errors in the metadata definition, then the repository system would flag the incorrect fields and prompt the Actor for the proper information. The Actor then commits the resource to the repository. 10. The repository automatically assigns a unique identifier upon successful submission of the resource(s) but is transparent to the Actor. The unique identifier completes the metadata description and is stored in the metadata location of the database.
Post-conditions	• The repository system stores a copy of the new resources' metadata on the repository system the submission was made. • The repository locally stores the resource in a location accessible to the distributed repository system. • The repository system keeps a separate copy of the resource metadata. • The repository stores content separately from the metadata to increase performance and disaster recovery actions.
Notes	• This use case requires that a process and system be in place to verify and manage actor access. • This use case requires that the vocabulary, policy and procedures be in place to allow metadata resource elements to be consistently specified and available for use in searches. Standard approaches to assigning keywords and employing taxonomies would facilitate searching. • This use case also requires that the repository system is able to authenticate users and determine their permission levels for like tagged resources. • This use case requires that the repository system is able to at a minimum log access to resources and implement other security mechanisms as appropriate to the security model implemented. • The generic word "permission" was used to indicate a given computer security model. The DOD employs several models to protect data, the procedures and degree to which these data classes are protected are through password hashing IAW FIPS 140-1, 128 bit Secure Socket Layer, and unique user identification and password. • The Learner is placed in parentheses in the actor list. The Learner will access learning resources through an intermediary Learning Management System (LMS)

The 82 Training Wing (TRW) at Sheppard Air Force Base is seeking to acquire a Developers' Resource Library (DRL) to store and share reusable assets and objects for use in training

software development amongst all its units. Their main focus is to have a place to store technology insertions and simulations and the assets used to make them, but the referenced Software Requirements Specification from the 82 TRW indicates that they also intend to accommodate SCOs. Basic requirements for the DRL include the ability to upload content, search and administer users. Content is categorized into the following broad categories:

1. AGE
2. Aircraft
3. Civil Engineering
4. Documentation
5. Faculty Development
6. Logistics
7. Medical
8. Telecommunications
9. Test Stations
10. Transportation

Most of these broad categories breakdown further into taxonomic structures with Aircraft being classified according to both aircraft system and model. 82 TRW has spoken with AFIADL concerning these requirements and their desire to obtain a system.

5.4 Marine Corps Use Cases and Requirements. The Marine Corps Distance Learning System (MarineNet) is built on a COTS Enterprise Content Delivery Network (eCDN) to meet its requirement of delivering high-quality, media-rich, interactive Web-based learning content while maintaining centralized management of that content. Content is housed on a master content repository located in a Distributed Learning Network Operations Center (DLNOC). A device called a Content Commander collocated at the DLNOC moves content from the repository to the user's local network environment so that it can run unimpeded by network security measures. The repository is unsophisticated and is not configured for sharing information, only housing content. The Marine Corps Distance Learning Center (DLC) has expressed an interest in a capability that would allow for sharing of learning content and interoperability with other organizations. The Marine Corps shares training content with the Army (for example, basic tank operation and maintenance courses) and the Air Force (V-22 pilot and maintenance training). The Marine Corps is also interested in sharing courseware with the Navy.

5.5 National Guard Use Cases and Requirements. The Distributive Training Technology Project (DTTP) provides the capability to manage the search, acquisition and delivery of digital learning content for the National Guard (NG). The DTTP system is highly dependent on the Army National Guard Network (GuardNet XXI). GuardNet XXI is a complex Asynchronous Transfer Mode (ATM) telecommunications network that delivers voice, video and data services to support readiness, mobilization, command and control, and computer emergency response, in addition to the various missions like distance learning. DTTP supports over 300 classrooms across the United States and its territories, and is committed to achieving these missions by leveraging the best instructional methodologies, information systems and communications technologies to deliver education, training and performance-enhancing tools.

5.5.1 ***Security – DTTP.*** NG requires that content and metadata be controllable at both the network and application level. DTTP also needs to facilitate stewardship of Intellectual Property Rights by addressing access and usage criteria and processes as well as recognition and compensation issues. (UC-DOD-3)

5.5.2 ***Packaging and Tagging – DTTP.*** NG requires that appropriate taxonomies and metadata be established and maintained to facilitate search and retrieval.

5.5.3 ***Storing – DTTP.*** Storing content fits into the NG's overall strategy for content lifecycle management including requirements specification, quality assurance and version control. (UC-DOD-4)

5.5.4 ***Searching – DTTP.*** DTTP envisions a system with a centralized search capability guided by Communities of Practice (CoP) which determine the authoritativeness of learning content residing in military, academic and industry repository systems as well as those internal to it (Figure 2). Information is organized through an Advanced Search Catalog System (ASCS) with the aide of metadata. Searches and access to content is coordinated through a Knowledge Content Management System (KCMS). Content can come from a variety of sources as depicted. (UC-DOD-1, UC-DOD-2)

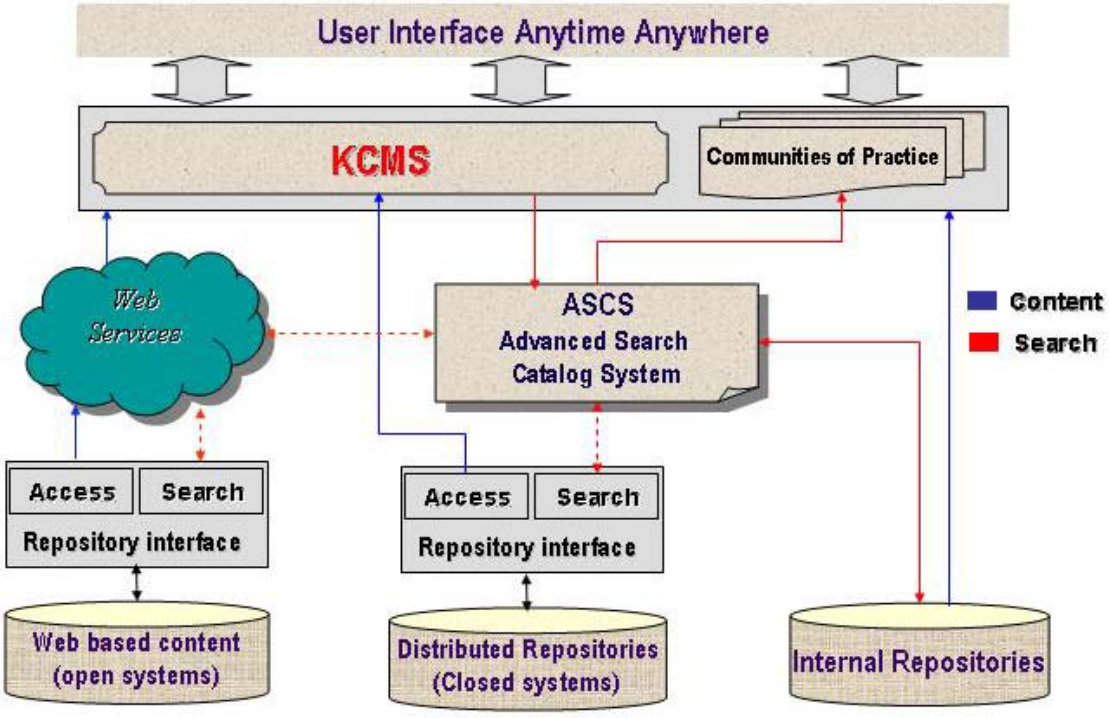

Figure 2. DTTP Architecture

5.5.5 ***Heterogeneous Repository Interoperability – DTTP.*** NG requires interoperability with the Army's ATIA, and an enhanced relationship with federal and state Governments. (UC-DOD-6)

5.6 <u>Joint Service Use Cases.</u> The US Joint Forces Command (USJFCOM) was assigned a designated agent on 24 April 1999 along with the General Secretariat of the Swiss Federal Department of Defence, Civil Protection and Sports to execute a Memorandum of Understanding (MOU) between the United States and Switzerland. The intent of the MOU is to implement a new vision for Partnership for Peace (PfP) training and education proposed by the U.S. Secretary of Defense proposed to the Euro-Atlantic Partnership Council (EAPC). The MOU which was approved as part of the North Atlantic Treaty Organization (NATO) Summit Communiqué consists of three integrated initiatives:

- a distributed simulation network;
- a network of regional training centers;
- a Consortium of Defense Academies and Security Studies Institutes.

The formally stated vision for the implementation of the Swiss - US MOU is to create, operate, and maintain an open-source standards-based system providing multi-sensory, universal access to a knowledge portal in support of international security cooperation. To that end, plans will be developed to include strategic, collaborative, educational and technological goals. These strategies will foster reusable, modular, quality content that responds to user defined information and learning requirements. To meet these goals and requirements, the Consortium, industry, government, educational and other sources will be leveraged to incorporate leading-edge technologies. All efforts are intended to enhance the work of the Consortium and may benefit other willing participants.

USJFCOM is working on a distributed digital repository architecture to support the knowledge portal based on a metadata harvesting approach. The architecture employs the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) which defines a means to expose metadata so that it can be collected into a single location for purposes of searching and other value added services. Figure 3 depicts the current USJFCOM architecture.

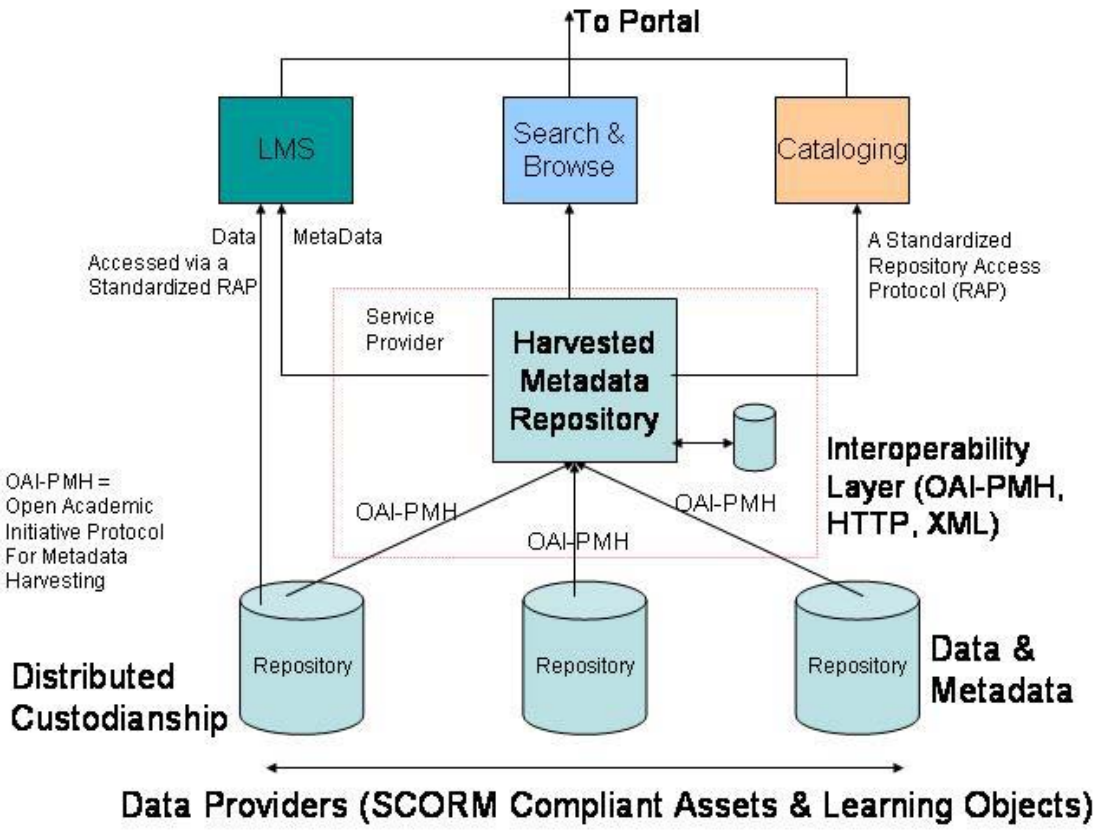

Figure 3. OAI Compliant Distributed Digital Repository Architecture

5.7 <u>Defense Acquisition University (DAU) Use Cases and Requirements</u>. DAU plans to stand up a geographically distributed repository system across 5 campuses across the country by fiscal year 2007. The system will consist of one digital repository for each Community of Practice (CoP) mirrored for redundancy and safekeeping across the 5 locations. The current system resides entirely in a single location at DAU Headquarters. The current plan calls for the development of instructional content that addresses each area from the perspective of several different learning styles.

5.8 <u>Visual Information Management System (VIMS)</u>. VIMS is an American Forces Information Service (AFIS) program that provides a means to ingest, store, distribute and manage multimedia assets consisting of still pictures, motion media, graphics, audio files and text documents for the Department of Defense (DOD). AFIS's responsibility is to ensure that high-quality multimedia assets are available and rapidly distributed throughout the DOD to support the war-fighter, to promote and sustain unit and individual readiness, for training, and to inform the American people about the roles, missions, and activities of the United States military. While the items managed in VIMS are not considered learning objects by themselves, they can be used to create learning content. VIMS is consequently considered a valid use case for purposes of this document.

5.8.1 ***Security - VIMS.*** VIMS is required to adhere to the security criteria outlined in DOD Directive 5200.28 Security Requirements for Automated Information Systems. VIMS must provide the ability to apply pre-defined restrictions to multimedia assets and users.

5.8.2 ***Packaging and Tagging - VIMS.*** Since VIMS is focused on the storage and distribution of assets, the system does not have requirements for the packaging of content or SCOs. The system is required to allow for customizable metadata fields, and plans to apply SCORM metadata.

5.8.3 ***Storing – VIMS.*** VIMS must be capable of ingesting a large variety of analog and digital multimedia formats as well as archival, presentation and decision quality formats.

5.8.4 ***Searching – VIMS.*** VIMS must also provide an e-commerce component that permits users and customers to view, request and receive multimedia assets.

5.8.5 ***Heterogeneous Repository Interoperability - VIMS.*** VIMS will be connected with the Defense Information System for Sharable Content Objects (DISSCO) being developed under the ADL Content Clearinghouse Portal (ACCP) prototype project. DISSCO currently is an indexing system for storing SCORM metadata for learning objects with provisions for future interface links to other DOD registries and repositories.